DATE: February 4th, 2020

TO: UCM Medical Staff, Housestaff, Nursing Staff, and Patient Care Centers

FROM:

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RE: Updated Blood Gas Reference Ranges and Co-Oximetry Reporting

Starting February 5th, 2020, the Rapid Response Laboratory (Central Clinical Laboratories) and the Respiratory Care Laboratory in Comer (NICU Lab K239) will report the complete co-oximetry panel with every blood gas order. Additionally, reference ranges for mixed venous\textsuperscript{1}, cord\textsuperscript{1,2}, and capillary\textsuperscript{3} blood gas tests will be updated. These updates are expected to be phased in over a period of two weeks.

This co-oximetry panel consist of:
- \(SO_2\) (%): measured oxygen saturation of functional hemoglobin (\textit{i.e.} \(O_2Hb\) and \(HHb\))
- Total Hemoglobin (\(tHb, g/dL\))
- \% Oxyhemoglobin (\(O_2Hb\)): measured oxygen saturation of total hemoglobin
- \% Deoxyhemoglobin (\(HHb\)): deoxygenated hemoglobin
- \% Carboxyhemoglobin (\(COHb\)): a stable complex of carbon monoxide and hemoglobin
- \% Methemoglobin (\(MetHb\)): hemoglobin with iron in the \(Fe^{3+}\) state not able to bind oxygen

\(O_2Hb\), \(HHb\), \(COHb\), \(MetHb\) are reported as \% of total hemoglobin and add up to 100%.

Definitions\textsuperscript{4}:
- \(SO_2\) (%) = \(\frac{cO_2Hb}{[cO_2Hb + cHHb]}\) x 100
- \% Oxyhemoglobin = \(\frac{cO_2Hb}{[cO_2Hb + cHHb + cCOHb + cMetHb]}\) x 100
Please note that:
1) SO₂ is the measured oxygen saturation of functional hemoglobin (O₂Hb and HHb) and it does not account for the presence of dyshemoglobins like COHb and MetHb.
2) In the absence of dyshemoglobins, SO₂ (as determined by pulse oximetry or co-oximetry) should be equal to % oxyhemoglobin. In the presence of elevated COHb or MetHb, the % oxyhemoglobin will be significantly decreased in comparison to SO₂. In such a situation (e.g. severe CO poisoning), the SO₂ typically will be within normal limits while the O₂ content may be severely decreased leading to potentially fatal outcomes if not recognized.
3) Thus, it is important to review the complete co-oximetry panel and not just the SO₂ result.

If you have any questions, please contact Dr. van Wijk by email at xvanwijk@bsd.uchicago.edu or by phone at 773-702-2806.

References